

Applicant #: \_\_\_\_\_

Question #   I  

Answer on these pages, tear from the booklet and submit with the answer

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packet if you chose Option A for Part I of this examination.

Professional Foresters Registration Examination, April, 2018

**PART I**

Instructions: APPLICANTS, PLEASE READ THESE INSTRUCTIONS CAREFULLY. You MAY complete PART I by doing ONE of the following two options:

A) Complete the Short Answer Section (Question 1) and Any Two (2) of the Essay Questions (Questions II through V)

**OR**

B) Complete Any Three of the Essay Questions (Questions II through V) and OMIT answering the Short Answer Question (Question I).

Question II - Forest Mensuration

Question III - Forest Ecology

Question IV-Silviculture

Question V - Forest Protection

Professional Foresters Registration  
1416 9th Street, Room 1506-16  
Sacramento, CA 95814

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### ACRONYMS AND ABBREVIATIONS USED IN THIS EXAMINATION

The following Acronyms and /or Abbreviations **may be used** in this examination.

Technical abbreviations that should be known by a forester are NOT included here (e.g. DBH, MAI, MBF). You may remove this page for reference throughout this examination. **It need not be returned.**

<u>Acronym or Abbreviation</u>	<u>Full Text</u>
BLM	Bureau of Land Management, USDI
BOF	California State Board of Forestry and Fire Protection
CA	California
CCR	California Code of Regulations
CAL FIRE	California Dept. of Forestry and Fire Protection
CDF&W	California Department of Fish and Wildlife
FPR	California Forest Practice Rules
PRC	California Public Resources Code
RPF	California Registered Professional Forester
THP	California Timber Harvest Plan
TPZ	California Timber Production Zone
USFS	United States Forest Service, USDA

FA=Forest Admin, FE=Forest Ecology, FEng= Forest Engineering, FEcon= Forest Economics, FM= Forest Management, FPol= Forest Policy, FP= Forest Protection, FMens = Forest Mensuration, FS=Silviculture

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**Question # 1 Short Answers**

4%     1. Today, forest managers generally recognize that large woody debris (LWD) is important in influencing the biology and habitat values of streams in temperate ecosystems. List four (4) biological and/or habitat functions of LWD in forested streams of California.

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3%     2. What is the common name of a California native fern that may indicate wet conditions in a forested environment?

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3%     3. A stream that derives most of its nutrient energy source from such things as terrestrial insect drop and litter-fall from terrestrial vegetation is described as an

\_\_\_\_\_ type of stream?

3%     4. On the next page are three diagrams of cable logging/yarding systems commonly used in the western U.S. Using the number and configuration of cable-lines, identify each logging system by the most commonly used name in the field. (You may write the answers on or beside the figures.)

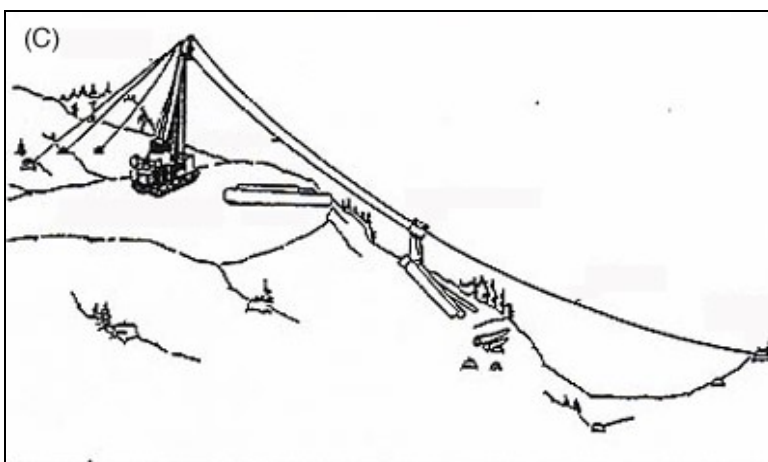
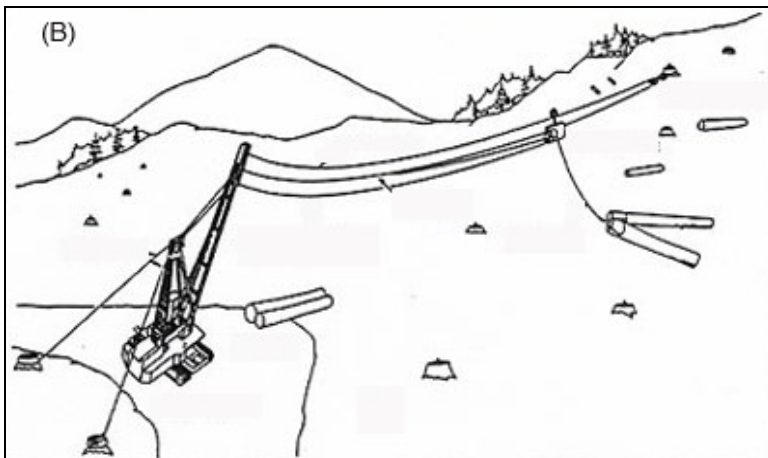
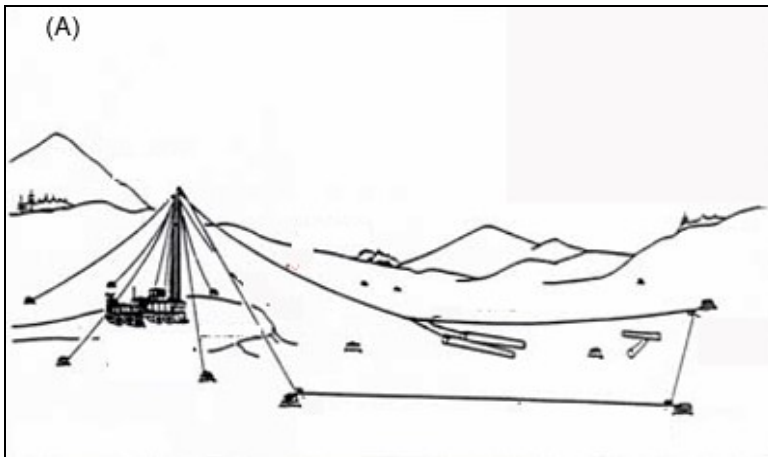
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packet if you chose Option A for Part I of this examination.

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3%     5. What is the radius of a 1/5-acre inventory plot? Round to the nearest tenth.  
Show your work: \_\_\_\_\_

\_\_\_\_\_

2%     6. What is a hypsometer? Give two (2) examples of hypsometers  
commonly used by foresters.

\_\_\_\_\_

\_\_\_\_\_

3%     7. List three (3) in-stream conditions that can result from land management  
activities and can negatively impact fish populations.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

3%     8. According to the FPRs, for a Bald Eagle or a Peregrine Falcon, an active  
nest means a bird nest site at which efforts have recently occurred as determined  
by CDF&W within the last \_\_\_\_\_ years.

3%     9. Define the term hyporheic flow and describe one important effect it has  
on fish habitat.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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packet if you chose Option A for Part I of this examination.

3% 10. Give the scientific genus names of three (3) genera of bark beetles common to California conifers.

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2% 11. Certification of forestlands to attest that the management of such lands meets approved standards of a designated authority is common today. Give the complete name of two (2) main certification programs being used in the United States.

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3% 12. Next to the regulatory programs given below, give the correct name of the CA State Agency or Department that administers that program.

A. Streambed Alteration Review >

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B. Watershed Basin Plans>

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C. Forest Slash Burning >

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4% 13. Give the common name of two (2) deciduous, western U.S. forest tree angiosperm species that are monoecious and two (2) that are dioecious:

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packet if you chose Option A for Part I of this examination.

4%    14. In 2012, the Timber Regulation and Forest Restoration Fund was created. Explain how this Fund is fiscally supported and give two (2) uses for the dollars in this fund.

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3%    15. High definition remote sensing mapping products called LIDAR images are becoming more common in forestry and natural resource use. Briefly describe the technology creating these images.

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3%    16. According to the FPRs, a watercourse with an incised channel that does not shift position on a floodplain and where the channel has no contiguous flat, flood prone areas, and the width of the valley floor is less than 2 times the channel width at bank-full stage is termed a:

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2%    17. In a standard township, what section is southwest of section 15?

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3%    18. In mechanized felling, what is the function of an "accumulator"?

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packet if you chose Option A for Part I of this examination.

3% 19. As used in Mensuration, what is Stem Analysis?

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3% 20. Briefly explain the difference between Class P-1 and Class 1-1 nursery seedling stock.

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3% 21. Describe a hierarchical (structured, ordered) tree marking rule.

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3% 22. Name three (3) types of deductions (not defects) taken by log scalers for observable defects.

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**packet if you chose Option A for Part I of this examination.**

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4%    23. List four (4) types of defects (not deductions) that logs volumes will be deducted for by a scaler.

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3%    24. What type of tax is levied per timber unit of value harvested to enable the property owner to postpone the taxes normally due until such time as income is received from the property?

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3%    25. What is an Engineered Wood Composite?

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3%    26. A rectangular piece of land measures 36.5 chains by 28.8 chains. How many acres are in this piece of property? Show your work.

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3%    27. In Forest Economics, what is an Equilibrium State?

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packet if you chose Option A for Part I of this examination.

4% 28. What are two (2) of the three site index systems listed in the FPRs and the vegetation types in which they were originally developed to apply?

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3% 29. What ethical duty do you owe to the “real party of interest” in your agreement to prepare a THP?

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3% 30. What is Forest Genetics?

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3% 31. In Forest Management (Genetics), what is a Seed zone?

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3% 32. Define Antecedent Soil Moisture.

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**packet if you chose Option A for Part I of this examination.**

2%     33. The THP is a part of a process that has been certified as  
\_\_\_\_\_ to an EIR subsequent to a decision by the  
Secretary of the California Resources Agency.

***END OF QUESTION***

## QUESTION II - FOREST MENSURATION

### OBJECTIVE

To demonstrate your understanding of factors that may affect development of a suitable tree inventory method.

### SITUATION

The owners of two separate tracts retain you to develop inventories of wildland tree species on the two separate tracts. Each owner is interested in long term management of the tracts. (Tract descriptions follow the questions.)

### QUESTION

40 % 1. For **each** of the tracts described on the next page, explain and justify whether you would use **variable radius** (point) plots, **OR fixed area** plots **OR** a **combination** of variable radius and fixed plots to estimate CURRENT stocking and growth. Include in your discussion the appropriateness of the method when considering your client's goals.

2. The following inventory methods can be used in the prediction of future yield:

- Permanent sample plots (CFI)
- Re-inventory using independent plots (Separate inventories)
- Independent plots measured at one point in time (One-time inventory)

30 % 2. a. Compare and explain each of the three (3) methods in terms of how volume is determined, accuracy of the resulting growth information, and treatment of in-growth and mortality.

30 % 2. b. Justify which method you would use on **each** of the two (2) tracts considering your client's goals.

### TRACT 1

A 15,000-acre tract of mixed conifer currently owned by another private landowner (not your client) located in the Sierra Nevada Mountains near Lake Tahoe. The terrain of the tract is a generally gentle slope and all age classes of timber are present. The current landowners have held the property for the last 50 years and have been actively harvesting the timber using single-tree selection and small group selection. Your client is interested in purchasing this tract for long-term timber management. The purpose of the timber inventory will be to determine standing inventory, stand growth, and project future yields if managed using the single-tree selection and small group selection harvest systems.

CONTINUED ON NEXT PAGE

## TRACT 2

A 5,000-acre tract of foothill/woodland located near an urban area that was burned in a wildfire 10 years ago. The terrain of the tract is generally gentle slopes and covered with 6-foot high brush, sprouting interior live oak, individual remnant ponderosa pine, ponderosa pine seedlings, and remnant California white and black oaks with seedlings in separate areas. Your client is a municipality interested in long-term watershed management of the tract. Purchase is almost certain as the municipality has been working on this with a land trust that purchased and currently owns the property. Because of the high value as an urban watershed they intend to experiment with a variety of cultural treatments to enhance water yield, wildlife habitat and tree growth. They will be making periodic comparisons of the resulting vegetation as well as economic costs and benefits of each treatment.

**END OF QUESTION**

### QUESTION III-FOREST ECOLOGY

#### OBJECTIVE

Demonstrate your understanding of the potential effects of forest land management activities on the beneficial uses and water quality of lakes.

#### SITUATION

Concern has been expressed in areas such as the Tahoe Basin that commercial forestry and other forestland management operations could contribute to deterioration of water quality. Similar concerns exist in California and other states for both fresh and ocean waters. An oligotrophic lake is a lake with low primary productivity, as a result of low nutrient content. These lakes have low algal production, and consequently, often have very clear waters, with high drinking-water quality. The bottom waters of such lakes typically have ample oxygen.

#### QUESTION

10% 1. Define cultural eutrophication.

40% 2. **Explain** the journey of oligotrophic lake waters towards reduced water quality in terms of **processes** and **ecological consequences**.

20% 3. Identify and briefly discuss four (4) important types of common commercial forest management practices that might contribute to cultural eutrophication;

30% 4. Discuss the methods that might be followed to mitigate the eutrophication effects of the forest land-use practices you identified above.

**END OF QUESTION**

## QUESTION IV FOREST SILVICULTURE

### OBJECTIVE:

To demonstrate understanding of silviculture principles and their application to managed stands.

- 5% 1. As used in silviculture, what is stocking?
- 5% 2. As used in silviculture, what is thinning?
- 9% 3. Name three (3) primary objectives of thinning.
- 12% 4. Describe four (4) of the following thinning styles: crown thinning, free thinning, low thinning, mechanical thinning, selection thinning.
- 10% 5. What is stand density?
- 10% 6. What is the stand density as shown in "normal stand tables"?
- 5% 7. What is relative stand density?
- 5% 8. What is the major advantage of using a stand density index over basal area or volume per acre as a stocking guide?
- 6% 9. Rank the following species (mixes) from highest (1) to lowest (6) as to their Reinecke stand density index (SDI) maximum: Ponderosa pine (CA), Sierra Mixed Conifer, Coast redwood, White fir (CA), Incense cedar, Douglas fir (CA). Maximum Reinecke stand density index equals the number of stems per acre at full site occupancy when QMD = 10 inches dbh.
- 10% 10. What is stand density management? What two (2) specific control points are used in stand density management?
- 5% 11. What are density management diagrams? An example is shown below.
- 18% 12. Review the density management diagram for Douglas fir shown at the end of this question. The diagram is extracted from: Drew, T. J. and J.W. Flewelling. 1979. Stand density management: an alternative approach and its application to Douglas-fir plantations.
- 6% 12. a. If a plantation has 300 well established trees per acre, what QMD and average height will the stand have when the canopy closes?
- 6% 12. b. Assume that same stand is low thinned when the canopy closes. What should the residual TPA be of that thinning if you wish the stand QMD to be about 14" when density reaches the zone of imminent competition induced mortality?
- 6% 12. c. How many well-established seedlings are needed per acre to begin a stand which will have a QMD of 12 inches dbh when it reaches the zone of imminent competition mortality?

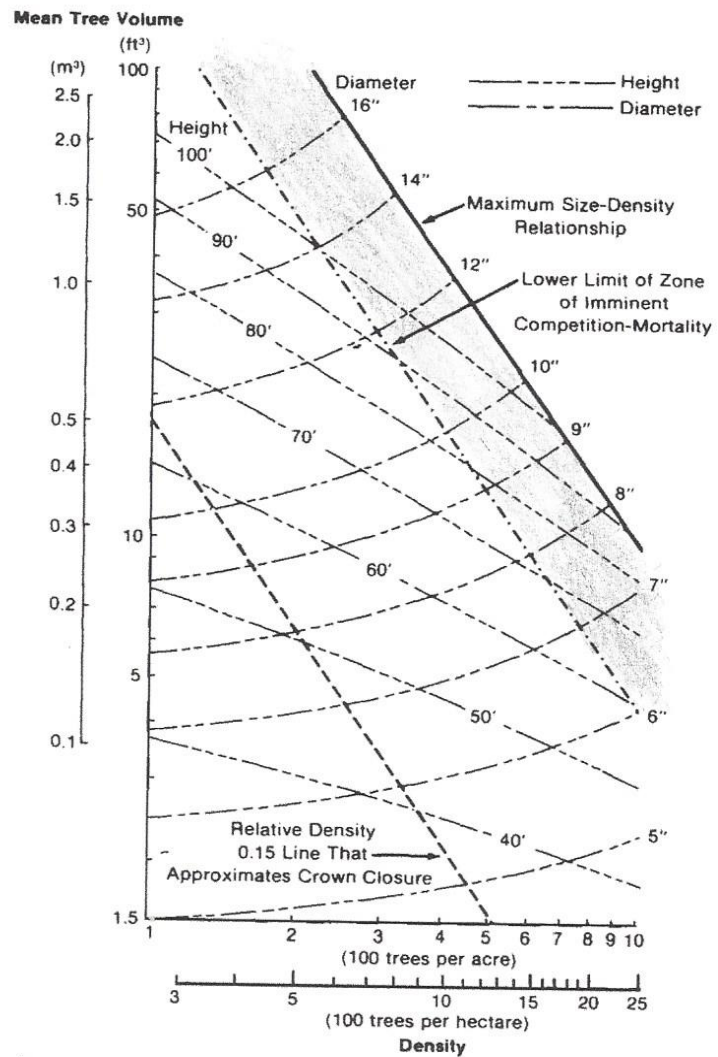


Figure 2. Stand management diagram for Douglas-fir with estimates of diameter and height.

**End of Question and Answer**



## QUESTION V- FOREST PROTECTION

### OBJECTIVE:

To demonstrate understanding of forest fuel management and fire.

### SETTING:

The timberland of California. Understanding the various forest fuels, their effects on fire, methods of management and resulting effects is essential to maintain sustainable California wildlands.

### QUESTIONS:

- 5%      1.      What are the three (3) components required to have a forest fire?
- 12%      2.      Define the following six (6) properties that describe forest fuels: Chemistry, Compaction, Continuity, Load, Moisture Content, and Size.
- 14%      3.      Define the following seven (7) forest fuel types: activity fuel, aerial fuel, fine fuel, ground fuel, heavy fuel, ladder fuel, and surface fuel.
- 8%      4.      The wildlands of California are often naturally fire prone thus most of the natural communities of plants and animals have adapted to natural fire conditions. Discuss four (4) significant factors that have contributed over the past century to greatly increasing the intensity, rate of spread, as well as the annual acreage burned on these lands.
- 6%      5.      Define the WUI and how does it affect fuel and fire management options?
- 5%      6.      What is Fuel Management?
- 10%      7.      What are five (5) of the potential benefits of Fuel Management?
- 10%      8.      What are five (5) of the potential disadvantages of Fuel Management?
- 15%      9.      Crown fires are the most damaging type of forest fires. They are common when wildfires burn under extreme weather conditions of ultra-low humidity and strong winds. What are the requirements for crown fire initiation and continuance under less than extreme weather conditions? Why? How does this knowledge guide fuel management decisions?
- 5%      10.      There are many tools available to manage forest fuels, among them is fire. What is a Prescribed Fire?
- 5%      11.      What is a Prescribed Fire Prescription? What physical elements does a Prescribed Fire Prescription address?
- 5%      12.      What are five (5) of the typical social (not the fire effects on fuel and vegetation) issues considered in a Prescribed Fire Prescription?

***End of Question***

**Professional Foresters Registration Examination April, 2018**

**Part II**

**Applicant Must Also Answer Three of the Remaining Five  
Essay Questions in Part II**

Question VI-Forest Engineering  
Question VII-Economics  
Question VIII-Forest Administration  
Question IX-Forest Policy  
Question X-Forest Management

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Sacramento, CA 95814

## QUESTION VI-FOREST ENGINEERING

### OBJECTIVE:

To demonstrate your understanding of concepts important in managing harvesting costs.

### SCENARIO:

The conversion of standing timber into logs, chips, or other forms of primary forest products is an important goal for a great majority of private timberland owners. It is of the utmost importance that harvest operations be conducted as efficiently as possible.

Assume that you are in charge of planning the access and harvesting on a newly acquired tract of forestland. Further assume that the tract of land is currently unroaded and is relatively flat so that ground based logging is efficient both up and down slope and best skidding system. You may also assume that the ownership is rectangular in shape. Assume that the tract of land is very large and your road system is not restricted nor hindered by adjacent ownership boundaries or environmental concerns. Trucks will be the preferred form of log transportation from the tract.

Further assume:

- Silvicultural System: Clear-cut
- Harvestable Volume per Acre: 30 MBF
- Average Road Construction Costs: \$30,000 per mile
- Fixed cost for skidding = \$2.00/MBF
- Variable cost for skidding = \$1.50/MBF/ 100 Ft of skidding distance
- Assume skidding and decking will be done direct to the roads and not at landings.
- Assume parallel roads for this problem
- Although it is normal to use a 1.2 factor to account for circuitry and slope in ground skidding problems, **do not adjust** for circuitry or slope in Average Yarding Distances used in this problem.
- Maintenance and other costs are negligible in this problem and may be ignored.

On the blank graph paper provided do the following:

**Applicant:** Note that there is a computation sheet that you **MAY** use to document your computations for Questions 1, 2 and 3. **If you decide to use this page, you must hand it in with your answer sheets.** To aid your solution of the entire problem, the computational table has the 300ft. road spacing computation completed.

- 15% 1. Plot the change in trend of the **cost of roads (\$/MBF)** as road spacing increases, within the limits shown on the X-axis of the graph. It will help the grader give you full credit, if you logically and neatly layout your computations. **(You must hand this graph in with your answer sheets).**

**CONTINUED NEXT PAGE**

- 15% 2. Plot the change in trend of the **cost of skidding (\$/MBF)** as road spacing increases, within the limits shown on the X-axis of the graph. **(You must hand this graph in with your answer sheets).**
- 15% 3. a.) According to the data given, what is the most economical road spacing (ERS)? Mark the ERS on the graph you plotted for Questions 1 and 2. Explain how you got this answer.
- 10% 3. b.) Since perfectly flat terrain without some control points which must be hit or missed by roads is not possible in most ownerships, explain what **range of values** in road spacing (ERS) you might find acceptable compared to the ERS that you computed in 3a. Use your graph to explain your logic and answer.
- 15 % 4. Briefly explain what important trends and relationships in logging cost control are demonstrated in this hypothetical situation.
- 15% 5. The fixed cost of skidding can be made up of several elements. Define fixed or indirect cost and how they differ from variable or direct costs. List five (5) items which could logically be included in the fixed cost of skidding.
- 15% 6. Suppose that Harvestable Volume per Acre: is reduced from 30 MBF to 15 MBF. Assume that the other costs remain the same. Explain how this fact might change your ERS? You may draw your graph for this Question on the graph paper provided to illustrate. (Note, you are not required to numerically justify your answer. Verbal, relative, qualitative answers will do.).

**(Columnar Computational Paper)**

Road Spacing in feet	Acres accessed per 100 ft. station	Cost \$ per station of road	Road cost per acre accessed \$	Volume per acre, MBF	Road Cost per MBF, \$
300	75	27.5	2.00	1.13	30.63

**I**

			<b>Q. 1, 2, 3 ANSWER GRAPH PAPER</b>								
	35										
	30										
<b>S</b>	25										
<b>per</b>	20										
<b>MBF</b>	15										
	10										
	5										
	0										
		5	10	15	20	25	30	35	40	45	50
				<b><i>Road Spacing, ft x 100</i></b>							

			<b>Q. 1, 2, 3 ANSWER GRAPH PAPER</b>									
	35											
	30											
<b>S</b>	25											
<b>per</b>	20											
<b>MBF</b>	15											
	10											
	5											
	0											
		5	10	15	20	25	30	35	40	45	50	
					<b>Road Spacing, ft x 100</b>							

**END OF QUESTION**

## QUESTION VII-FOREST ECONOMICS

### OBJECTIVE

To demonstrate understanding of the relationship of value to specific variables within a forest timber management regime.

### SITUATION

Many contemporary resource management projects involve decisions regarding the harvest, retention or manipulation of forest vegetation. In making management recommendations it is important for an RPF to understand the relationship between value and resource elements.

### QUESTIONS

1. For any important commercial forest tree species grown in California:

10% 1. a. Draw a graph illustrating what you consider to be a typical relationship between STUMPAGE VALUE PER MBF LOG SCALE (vertical axis), and DIAMETER AT BREAST HEIGHT (horizontal axis). Graph paper provided on the next page.

25% 1. b. Discuss the dynamics of, and reasons for, what occurs along the curve you have drawn. Label critical points.

20% 2. The SHAPE of the curve (relationship between VALUE and DBH) will change over time with changes in forest product prices, logging costs, and processing costs etc. Discuss IN DETAIL what forces might lead to substantial changes in the shape of the curve.

3. Financial Maturity

15% 3. a. Explain how the concept of financial maturity works when making decisions on the harvesting of EVEN-AGED timber stands.

15% 3. b. Explain how the concept of financial maturity, as discussed above, might be adapted to determine optimal lengths of cutting cycles and the levels of residual growing stock when timber stands are being managed utilizing the selection method.

15% 3. c. Explain which economic factors, other than financial maturity, would be important in a "real world" situation of a timberland owner deriving income by selling stumpage from a 10,000-acre tract. (Do **not** consider the case of an owner who processes his own timber.)



			Relative Log Stumpage Value by DBH Class									
	25											
Relative	20											
\$ / MBF	15											
	10											
	5											
	0	5	10	15	20	25	30	35	40	45	50	
						DBH						

**END OF QUESTION**

## QUESTION VIII- FOREST ADMINISTRATION

### OBJECTIVE:

To demonstrate your understanding of forest administration requirements under California's Z'Berg-Nejedly Forest Practices Act.

### SITUATION:

The property is a 5,000-acre parcel in the Sierra Nevada Mountains at 5000-6000 feet elevation. It is a privately owned forested property, with some of the ownership zoned as Timberland Production Zone (TPZ) and some not zoned as TPZ. The non TPZ property has an established destination ski resort. The owner intends to expand the ski resort with two new long ski runs and an additional ski lift. An environmental study pursuant to the California Environmental Quality Act (CEQA) has been completed and the owner has been granted an approved county permit to expand his ski area, the Board of Supervisors having tentatively approved an immediate rezoning for use as a ski area.

The area is forested, but the timber in the project area is relatively small and volumes are low. Some trees are of commercial size 20-24 inches in diameter. These are widely scattered. The project area is 32.5 acres and the volume of timber to be cut is approximately 30 MBF with additional unknown quantities of smaller than sawlog sized trees. The expansion project area is on the portion of the ownership not zoned as TPZ, but it is definitely timberland.

To avoid further project review by the California Department of Forestry & Fire Protection (Cal Fire), and incurring the expense and delay of obtaining a Timber Harvesting Plan (THP) or other state harvesting permits, the owner intends to cut the trees in the ski run, pile them and burn most of them. Some will be chipped and spread over the graded ski run.

### QUESTIONS:

1: 40%

5% 1. a. Define Timberland as per the FPR.

5% 1. b. Define timber operations as per the PRC.

5% 1. c. Define Commercial purposes as per the PRC

25% 1. d. Is the landowner correct in his presumption that avoidance of any commercial sale of the timber removes the necessity for submission of a THP and Cal Fire review of this proposed operation? Explain your answer and cite substantiation for your reasoning, including but not limited to the California Forest Practice Rules, Z'Berg-Nejedly Forest Practice Act, and/or Public Resources Code.

**Continued Next Page**

30% 2. Would your answer change if the proposed clearing area **was** on some of the ownership zoned as TPZ? Explain your answer and cite substantiation for your reasoning, including but not limited to the California Forest Practice Rules, Z'Berg-Nejedly Forest Practice Act, and/or Public Resources Code and the Timber Tax Reform Act.

30% 3. When a permit is required to convert timberland to non-timber uses, what permit(s) or authorization(s) will be required from Cal Fire. Be explicit as to your reasoning for your answer and precise in the type of permit or authorization (if any) that will be required.

**END OF QUESTION**

## QUESTION IX- FOREST POLICY

### OBJECTIVE:

To evaluate your understanding of Federal Laws that effect private forests in California and other states.

### SCENARIO:

Private forestry operations are regulated by a fairly complex set of laws, regulations, and non-regulatory policies at the federal, state and local level. The resulting framework can be complicated and can vary widely between jurisdictions. While RPFs are expected to understand State of California forest practice regulations and policy, they are also expected to understand certain Federal Laws that also must be understood and complied with in forestry operations in California.

### QUESTIONS:

50% 1. The **Federal Clean Water Act.**) is arguably the predominantly federal law impacting private forest land operations. Write a relatively complete explanation of what this Act or set of Regulations covers and how these laws have been implemented in California for forestry on private lands from a RPFs standpoint.

50% 2. Listed below are four other Federal Acts, write a relatively complete explanation of TWO (2) of these acts and how these laws have been implemented in California for forestry on private lands from a RPF's standpoint. Discuss what each Act or set of Regulations covers and how these laws have been implemented in California for forestry on private lands.

- A. Clean Air Act
- B. Endangered Species Act
- C. Insecticide, Fungicide, and Rodenticide Act
- D. Coastal Zone Management Act

**END OF QUESTION**

## QUESTION X- FOREST MANAGEMENT

### OBJECTIVE:

To demonstrate your understanding of the relationship between forest management practices and the maintenance of forest structure and composition at various scales for wildlife diversity.

### QUESTION:

40% 1.

5% 1. a. Define late successional forest stands. FPR definition acceptable but not required.

35% 1. b. Discuss why the size and spatial arrangement of late succession stage forests (and stands) is believed to be critical for maintenance of species dependent upon that habitat. Include in your discussion how landscape design techniques or harvest unit layouts can mitigate potential adverse effects on wildlife inhabiting late succession stage forests.

40% 2. Discuss three (3) elements of structure **and** three (3) elements of composition of late succession stage coniferous forest habitat. Include the benefits to wildlife and how these elements might be favored when designing harvest units.

20% 3. Briefly describe the positive and negative effect of an increase in ecotonal acreage across a forested landscape on plant and animal species richness.

**End of Question**

**END OF EXAM**